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Claims

[c1] 1. A method for controlling an electric motor, comprising:
determining an electric motor rotational speed;
operating said electric motor using a sensorless control system if said electric motor rotational speed is above a predetermined threshold; and
operating said electric motor using a sensor based control system if said electric motor rotational speed is below said predetermined threshold.

[c2] 2. The method according to claim 1, further comprising correcting said sensorless control system with said sensor based control system.

[c3] 3. The method according to claim 1, further comprising correcting said sensor based control system with said sensorless control system.

[c4] 4. The method of claim 1, wherein the step of operating said electric motor using a sensorless control system if said electric motor rotational speed is above a predetermined threshold comprises the steps of:
determining motor speed and position from a plurality of

phase current and phase voltage signals;
determining an inverter voltage command from said motor speed and position; and
determining the plurality of phase current and phase voltage signals from said inverter voltage command.

[c5] 5. The method of claim 4, further comprising:
determining motor speed and position from a position sensor; and
correcting said phase current and phase voltage signal determined motor speed and position with said position sensor determined motor speed and position.

[c6] 6. The method of claim 1, wherein the step of operating said electric motor using a sensor based control system if said electric motor rotational speed is below said predetermined threshold step comprises the steps of:
determining motor speed and position from a position sensor;
determining an inverter voltage command from said motor speed and position; and
determining a plurality of phase current and phase voltage signals from said inverter voltage command.

[c7] 7. The method of claim 6, further comprising:
determining motor speed and position from a plurality of phase current and phase voltage signals; and

correcting said position sensor determined motor speed and position with said phase current and phase voltage signal determined motor speed and position.

[c8] 8. The method of claim 1, wherein said predetermined threshold is about 50 rpm.

[c9] 9. The method of claim 1, wherein said predetermined threshold is in the range of about 10 rpm to about 100 rpm.

[c10] 10. A system to control an electric motor comprising:
an inverter operatively connected to said electric motor;
a position estimator operatively connected to said electric motor and said inverter;
a torque controller operatively connected to said position estimator and said inverter;
a position sensor operatively connected to said electric motor and said position estimator;
a processor for determining a first electric motor shaft position based on an output from said inverter;
said processor ordered to determine a second electric motor shaft position based on an output from said position sensor; and
said processor programmed to correct said first electric motor shaft position by using data related to said second electric motor shaft position.

[c11] 11. The system according to claim 10 wherein said processor is programmed to correct said second electric motor shaft position using data related to said first electric motor shaft position.

[c12] 12. The system according to claim 10, wherein said position sensor is a low resolution position sensor.

[c13] 13. The system according to claim 10, wherein said position sensor is an engine crankshaft position sensor.

[c14] 14. The system according to claim 10, wherein said position sensor is an engine camshaft position sensor.

[c15] 15. The system according to claim 10, wherein said position sensor is a transmission sensor.

[c16] 16. An vehicle comprising:
an electric motor;
an inverter operatively connected to said motor;
a position estimator operatively connected to said motor and said inverter;
a torque controller operatively connected to said position estimator and said inverter;
a position sensor operatively connected to said motor and said position estimator;
means for determining a first electric motor shaft posi-

tion based on an output from said inverter;
means for determining a second electric motor shaft position based on an output from said position sensor; and
means for correcting said first electric motor shaft position by said second electric motor shaft position output.

[c17] 17. The vehicle according to claim 16, further comprising means for correcting said second electric motor shaft position by said first electric motor shaft position output.

[c18] 18. The vehicle according to claim 16, wherein said position sensor is a low resolution position sensor.

[c19] 19. The vehicle according to claim 16, wherein said position sensor is an engine crankshaft position sensor.

[c20] 20. The vehicle according to claim 16, wherein said position sensor is an engine camshaft position sensor.

[c21] 21. The vehicle according to claim 16, wherein said position sensor is a transmission sensor.

[c22] 22. An article of manufacture for controlling an electric motor, comprising:
a computer readable storage device; and
a control strategy embodied in said computer readable storage device for directing a computer to control the steps of determining an electric motor rotational speed,

operating said electric motor using a sensorless control system if said electric motor rotational speed is above a predetermined threshold, and operating said electric motor using a sensor based control system if said electric motor rotational speed is below said predetermined threshold.

[c23] 23. The article of manufacture according to claim 22, wherein said predetermined threshold is about 50 rpm.

[c24] 24. The article of manufacture according to claim 22, wherein said predetermined threshold is in the range of about 10 rpm to about 100 rpm.